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SCIENCE

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A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

SEVENTH YEAR.
VOL. XIII. No. 326.

NEW YORK, MAY 3, 1889.

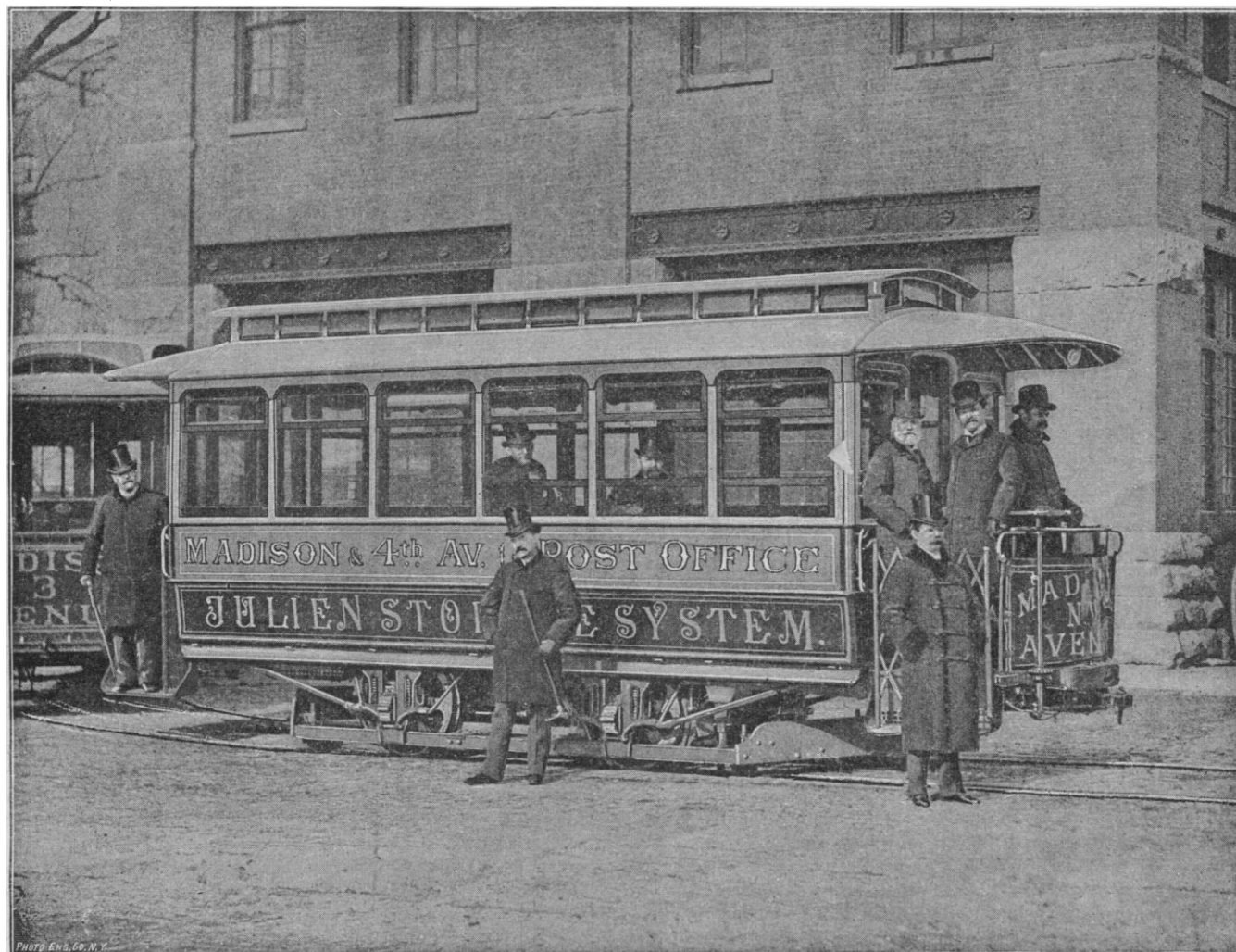
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\$3.50 PER YEAR, IN ADVANCE.

STORAGE-BATTERIES FOR STREET-CARS.

THE last car which the Julien Electric Traction Company put into actual passenger service (Car No. 7), and which is the standard type of car that they have finally adopted, is making five round trips per day between 86th Street and Madison Avenue and the Post Office, or $57\frac{1}{2}$ miles daily. This is a car-day's work on that line. They claim a saving per year in favor of the Julien system,

Car No. 1, on the Fourth Avenue line, commenced service on Sept. 3, and on April 8 the batteries were examined for the first time. They had not in this period been lifted from the cells to be cleaned or inspected. It is claimed that they were found to be in as good condition as when they were put in service; not a single plate in the whole battery showing any wear, injury, or depreciation.

At one time it was thought that the handling of the batteries in



STREET-CAR DRIVEN BY JULIEN STORAGE-BATTERIES.

on each car, as compared with horse-cars, of \$2,719.25, and that the net earnings will more than pay the entire cost of the car and its equipment at the end of the first year. During the time (forty days) the car has been in operation, neither the batteries nor the motors have required attention or the expenditure of one dollar for repairs or renewals. Even the brushes, it is claimed, have not been changed, nor do they show any wear.

this system of traction would be a serious obstacle; but this company has now a battery-shifting device, whereby, in the length of a car-body, and on either side of the pit over which the car stands in the station, sufficient batteries are stored and manipulated to do the work of one hundred and thirty-five horses. The racks which contain the batteries, and the hoists, which are run by two small stationary motors, do not, in all, cover as many cubic feet as two

sixteen-foot cars. By aid of this device the batteries are changed in less than three minutes. In actual time, less than five minutes are required to inspect the car thoroughly and change the battery.

A feature of this system is, that a street-railway need no longer have its own generating machinery, as must be the case with cables, overhead wires, and conduit systems. In every town and city where there is a central lighting-station, power for charging the batteries, it is stated, may be purchased for about two cents per horse-power; so that the plant of the system will be reduced to the devices of one battery-rack, as above described, for each set of fifteen cars, and switch-boards for governing the distribution of the current.

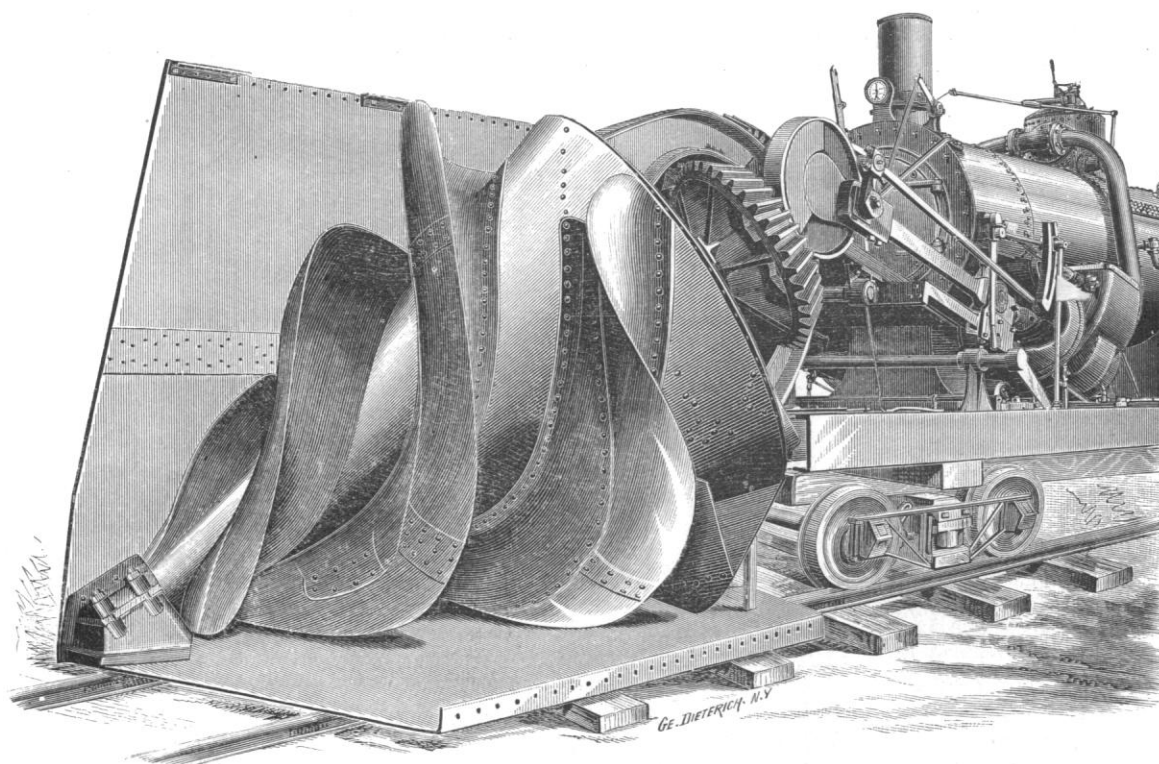
The cost of motive power for a car-day of 60 miles, the company estimate at \$3.10. By motive power, they mean cost of energy at two cents per horse-power, and \$700 per annum for maintenance of batteries and motor. These figures, they claim, are the result of their present experience. To those who may think two cents per horse-power a low estimate, they say that they have offers from electric companies to furnish power at that figure.

scratch or dull when touched. The varnish is mainly intended, of course, for "ivory" film negatives, and for this purpose nothing can be better. It will not crack or soften; dust, water, and foreign matter will not adhere to it; and retouching is facilitated by its use.

THE JULL SNOW-EXCAVATOR.

In December last the Jull Snow-Excavator Company sent out a preliminary circular, calling the attention of railroad officials to the fact that its snow-excavator was in course of construction, under recent patents of Mr. Orange Jull of Ontario, Canada. Since then the excavator has been completed, and submitted to three severe tests on the Rome, Watertown, and Ogdensburg Railroad at Oswego, N.Y.

On March 6, 1889, the excavator cleared seven hundred and fifty feet of track, covered with hard frozen snow varying in depth from two to seven feet. The snow was thrown a distance of sixty feet. This was a particularly severe test, by reason of the fact that the snow had been lying upon the siding during the entire winter, and



JULL SNOW-EXCAVATOR, WITH HOOD REMOVED.

The new cars, thirty of which are now under construction by the Stephenson Company, will weigh but a fraction over six tons; or, in other words, but little more than the cars of the overhead system.

IVORY VARNISH.

A NEW medium for protecting glass negatives and positives from injury by dampness, friction, or moist printing-paper, has recently been introduced under the name of "ivory varnish," according to *The Photographic Times*; and, so far as experiments with it have progressed, it seems to be an excellent and safe compound. As it dissolves pyroxiline, however, it cannot be used for collodion plates; but it is perfectly applicable to gelatine negatives. The latter need not even be heated when the varnish is applied, but the preparation is merely flowed over their surface and dried in an ordinary temperature. The result is a protective film of extreme hardness, which perfectly resists the action of all moisture. A negative thus varnished, after being thoroughly dried, may be immersed in hot water of 120° F., and wiped dry with a rag, without injury. This quality makes the "ivory varnish" an excellent one for transferred bromide prints. The damar varnish heretofore used for this purpose, being softened by a high temperature, will

was nearly as hard as solid ice. Some of the pieces of ice thrown out were afterwards weighed, and one was found which weighed seventy-five pounds.

On March 9, 1889, the excavator cleared a siding upward of nine hundred feet in length, filled with hard snow varying in depth from two to eight feet. The time consumed was not taken on either of the above occasions; but the excavator worked steadily, and without any stoppage whatever.

On March 11, 1889, the third exhibition was made at Oswego. This demonstration was witnessed by representatives of the Rome, Watertown, and Ogdensburg Railroad, the Lehigh Valley Railroad, and the Pennsylvania Railroad. In this case the excavator was timed, and exact measurements taken, by the railroad officials present, of the length of the cut, and depth of snow. The length of the cut was 720 feet; average depth of snow, 7 feet, varying in depth from 18 inches to 10 feet or more; the width of space cleared was 10 feet. This cut was cleared of snow, and the rails left clean, without the use of flangers, in seven minutes time. The motive power was furnished by two passenger-locomotives, one with a cylinder 16 by 22, and the other 17 by 24. The number of revolutions of the bladed cone did not exceed 180 per minute, although its capacity exceeds 300 revolutions per minute. Thus it